

### VOCABULARY STRATEGY

When you encounter a long term, such as *biogeochemical*, look for the smaller words or word parts within it. In *biogeochemical* you will find *bio-* (life), *geo-* (earth), and *chemical*. A *biogeochemical cycle* is one that involves Earth, chemistry, and life forms.

## The Carbon Cycle

In a biogeochemical cycle, a chemical element or compound is changed as it moves through the Earth system. The **carbon cycle** is a biogeochemical cycle involving the element carbon (C).

Carbon has been called the building block of life. It is present in all organic material and in materials, such as coal and oil, that are derived from once-living things. You may think of carbon as primarily a solid, but it can also form gases, such as methane ( $\text{CH}_4$ ) and carbon dioxide ( $\text{CO}_2$ ).

Carbon enters the atmosphere in several ways as carbon dioxide.

Living things, such as animals, breathe it out. Organisms that break down decaying organic matter give off carbon dioxide. When carbon-based materials burn, such as when trees are consumed in a forest fire, they release carbon dioxide into the atmosphere. Volcanic eruptions release carbon dioxide from inside Earth. Carbon dioxide also diffuses out of the ocean waters in which it is dissolved.

Carbon is also removed from the atmosphere. Plants remove carbon dioxide from the atmosphere during photosynthesis, and then release oxygen. The carbon is stored in their tissues as carbohydrates and passed on to animals that eat the plants.

Phytoplankton also play an important part in the carbon cycle.

Like land plants, these tiny oceanic organisms undergo photosynthesis. During photosynthesis, they take in carbon, in the form of carbon dioxide, and then release oxygen, which diffuses out of the water.

Most phytoplankton are eaten by marine animals. However, a small percentage of dead phytoplankton settle to the ocean floor. As they become part of the sediment, the carbon within them enters storage. A place that stores carbon, such as the ocean, is called a carbon sink.

The action of the ocean waves dissolves carbon dioxide in seawater; there, it is converted into bicarbonate and carbonate compounds, such as calcium carbonate (or lime), the major component of seashells. Through wave action and through photosynthesis by phytoplankton, the ocean removes about 40 percent of the carbon that is released into the atmosphere by the burning of fossil fuels.

Once removed from the atmosphere, carbon can be stored for long periods. In some cases, it is stored only for the life span of the plant or animal whose tissues contain it. When this plant or animal dies, its tissues are decomposed by bacteria. The decomposition process changes the carbon compounds in the tissues into carbon dioxide and methane.

Some parts of the carbon cycle happen quickly, such as when organisms live, die, and decay in a short time. Other parts of the cycle take longer, such as the formation of fossil fuels. If a plant or animal dies and seeps into a low-oxygen environment, such as marshland, the carbon in its tissues—given enough time—can change into fossil fuels such as coal and oil. When burned, these fossil fuels release the stored carbon back into the atmosphere. Carbon, like water, is never destroyed; it is only changed from one form to another.

### VISUALIZATIONS

CLASSZONE.COM  
Observe an animation showing evidence of the carbon cycle.  
Keycode: ES0106



A FOREST FIRE, such as this one in Yellowstone National Park, returns stored carbon to the atmosphere.



PLANTS, such as these on Washington's Olympic Peninsula, store absorbed carbon in their tissue.

